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 A method for identifying a drug candidate for promoting tissue-specific differentiation of a stem cell, the method comprising the steps of:

- (A) providing a library of test substances, the library comprising at least a first test substance and a second test substance, the first and second test substances having different molecular structures:
- (B) providing an in vitro culture of stem cells, the culture being divided into at least a first subculture and a second subculture:
- (C) contacting the first subculture with the first test substance and the second subculture with the second test substance;
- (D) culturing the first and second subcultures respectively contacted with the first and second test substances under conditions that would promote tissue-specific differentiation of the stem cells if an agent that promoted tissue-specific differentiation was in contact with the stem cells; and
- (E) analyzing the cells in the first and second subcultures for increased tissuespecific gene expression.
 - 2. The method of claim 1, wherein the stem cells are embryonic stem cells.
- The method of claim 2, wherein the embryonic stem cells are mammalian embryonic stems cells.
- The method of claim 3, wherein the mammalian embryonic stem cells are murine embryonic stems cells.
- The method of claim 4, wherein the murine embryonic stem cells R1 embryonic stems cells.

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- 1 6. The method of claim 3, wherein the mammalian embryonic stem cells are 2 human embryonic stems cells.
- 1 The method of claim 1, wherein the conditions that would promote tissuespecific differentiation of the stem cells comprises culturing the first and second subcultures 2 3 in a differentiating medium.
 - 8. The method of claim 1, wherein the conditions that would promote tissuespecific differentiation of the stem cells comprises culturing the first and second subcultures at about 37°C.
 - 9. The method of claim 1, wherein the conditions that would promote tissuespecific differentiation of the stem cells comprises culturing the first and second subcultures in a humidified, carbon-dioxide containing incubator.
 - 10. The method of claim 1, wherein the conditions that would promote tissuespecific differentiation of the stem cells comprises culturing the first and second subcultures for a time period of at least five days.
 - The method of claim 10, wherein the time period is at least seven days. 11.
 - 12. The method of claim 11, wherein the time period is between seven and eighteen days.
 - 13. The method of claim 1, wherein the first and second subcultures are cultured in a microtiter plate.

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- 14. The method of claim 1, wherein the step (E) of analyzing the cells in the first and second subcultures for increased tissue-specific gene expression comprises isolating mRNA from the first and second subcultures.
 - 15. The method of claim 14, wherein total cellular RNA is isolated from the first and second subcultures.
 - 16. The method of claim14, wherein the step (E) further comprises reversetranscribing the mRNA to create cDNA.
 - 17 The method of claim 1, wherein the step (E) of analyzing the cells in the first and second subcultures for increased tissue-specific gene expression comprises performing a polymerase chain reaction (PCR).
 - 18. The method of claim 14, wherein the isolated mRNA is immobilized on a substrate
 - 19. The method of claim 18, wherein the substrate is contacted with a probe that specifically hybridizes to the tissue-specific mRNA.
 - 20. The method of claim 1, wherein the step (E) of analyzing the cells in the first and second subcultures for increased tissue-specific gene expression is performing using gene chip technology.

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